

FORM PTO-1390

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE  
TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER:  
BO 42354

U.S. APPLN. NO. (If known, see 37 CFR 1.52)  
**09/913407**

INTERNATIONAL APPLICATION NO.:  
PCT/NL00/00084

INTERNATIONAL FILING DATE:  
11 FEBRUARY 2000

PRIORITY DATE CLAIMED:  
15 FEBRUARY 1999

TITLE OF INVENTION: SYSTEM FOR TREATING FLUIDS IN AN ELECTRIC FIELD

APPLICANT(S) FOR DO/EO/US: Jan Pieter DE BAAT DOELMAN

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
  2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
  3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
  4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
  5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
    - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
    - b. ☐ has been transmitted by the International Bureau. (see attached copy of PCT/IB/308)
    - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
  6. ☐ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
  7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
    - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
    - b. ☐ have been transmitted by the International Bureau.
    - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
    - d. ☐ have not been made and will not be made.
  8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
  9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
  10. ☐ A translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).
- Item 11. to 16. below concern document(s) or information included:
11. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
  12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
  13. ☒ A **FIRST** preliminary amendment.
  14. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
  15. ☐ A substitute specification.
  16. ☐ A change of power of attorney and/or address letter.
  16. ☒ Other items or information:

International Search Report  
PCT/IPEA/409  
Abstract of the Disclosure on a Separate Sheet  
Application Data Sheet

U.S. APPLICATION NO. (known, step 3, CFR 1.5)

09/913407

INTERNATIONAL APPLICATION NO.  
PCT/NL00/00084ATTORNEY'S DOCKET NO.  
BO 42354

## CALCULATIONS PTO USE ONLY

17. ☒ The following fees are submitted:**BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(5)):**

Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO ..... \$ 1,000.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO ..... \$ 860.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... \$ 710.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... \$ 690.00

International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) ..... \$ 100.00

ENTER APPROPRIATE BASIC FEE AMOUNT =

\$ 860.00

Surcharge of \$130.00 for furnishing the oath or declaration later than 30 months from the earliest claimed priority date (37 CFR 1.492(e)).

\$ 130.00

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE	\$
Total claims	5 - 20 =	0	X \$18.00	\$
Independent claims	1 - 3 =	0	X \$80.00	\$
MULTIPLE DEPENDENT CLAIMS(S) (if applicable)			+ \$270.00	\$

TOTAL OF ABOVE CALCULATIONS =

\$ 990.00

Reduction of 1/2 for filing by small entity, if applicable. Applicant claims Small Entity Status under 37 CFR 1.27.

+

\$ 495.00

SUBTOTAL =

\$ 495.00

Processing fee of \$130 for furnishing the English translation later than months from the earliest claimed priority date (37 CFR 1.49(f)).

\$

TOTAL NATIONAL FEE =

\$ 495.00

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +

\$

TOTAL FEES ENCLOSED =

\$ 495.00

Amount to be  
refunded:

charged:

a. ☒ A check in the amount of \$ 495.00 to cover the above fees is enclosed.b. ☐ Please charge my Deposit Account No. **25-0120** in the amount of \$ to cover the above fees. A duplicate copy of this sheet is enclosed.c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required by 37 CFR 1.16 and 1.17, or credit any overpayment to Deposit Account No. **25-0120**. A duplicate copy of this sheet is enclosed.

SEND ALL CORRESPONDENCE TO

**Customer No. 000466**

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August 14, 2001

By

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Benoît Castel  
Attorney for Applicant  
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09/913407

PATENTS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Jan Pieter DE BAAT DOELMAN

Serial No. (unknown)

Filed herewith

SYSTEM FOR TREATING FLUIDS  
IN AN ELECTRICAL FIELD

PRELIMINARY AMENDMENT

Commissioner for Patents

Washington, D.C. 20231

Sir:

Prior to calculation of the filing fee, please  
amend the above-identified application as follows:

IN THE CLAIMS:

Amend claim 3 as follows:

--3. (Amended) System according to claim 1,  
characterised in that the electronic circuit for energising  
the coil comprises an amplifier and a signal generator,  
whereby the amplification value is adjusted dependent on the  
signal from the field strength meter.

Amend claim 4 as follows:

--4. (Amended) System according to claim 1,  
characterized in that the feedback circuit comprises a band  
pass filter.--

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Add the following new claim:

--5. (new) System according to claim 2, characterised in that the electronic circuit for energising the coil comprises an amplifier and a signal generator, whereby the amplification value is adjusted dependent on the signal from the field strength meter.--

Jan Pieter DE BAAT DOELMAN

R E M A R K S

The above changes in the claims merely place this national phase application in the same condition as it was during the international phase, with the multiple dependencies being removed. Following entry of this amendment, the claims now in the case are claims 1-5.

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "VERSION WITH MARKINGS TO SHOW CHANGES MADE".

Respectfully submitted,

YOUNG & THOMPSON

By



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August 14, 2001

VERSION WITH MARKINGS TO SHOW CHANGES MADE

The claims have been amended as follows:

3. (Amended) System according to claim ~~1 or 2~~, characterised in that the electronic circuit for energising the coil comprises an amplifier and a signal generator, whereby the amplification value is adjusted dependent on the signal from the field strength meter.

4. (Amended) System according to ~~one of the preceding claims~~ 1, characterized in that the feedback circuit comprises a band pass filter.

ABSTRACT OF THE DISCLOSURE

System for treating fluids, especially water, in a pipe to resist scale deposits from building up in the pipe, includes a field generating coil (10) mounted exteriorly of the pipe, an electronic circuit (14) for energizing the coil to develop an alternating electromagnetic field in the fluid, a sensor (18) for sensing a parameter related to the functioning of the system and for generating a parameter dependant signal, a feed back circuit for feeding back the parameter dependent signal to the electronic circuit to control the circuit, wherein the sensor comprises a field measuring coil (16) mounted exteriorly of the pipe near the field generating coil, the feed back circuit comprises the electronics which together with the measuring coil acts as a field strength meter.

SYSTEM FOR TREATING FLUIDS IN AN ELECTRIC FIELD

The invention relates to a system for treating fluids, especially water, in a pipe to resist scale deposits from building up in the pipe, comprising

- 5 - a field generating coil mounted exteriorly of the pipe,
- an electronic circuit for energising the coil to develop an alternating electromagnetic field in the fluid,
- a sensor for sensing a parameter related to the functioning of the system and for generating a parameter dependent signal,
- 10 - a feed back circuit for feeding back said parameter dependent signal to said electronic circuit to control said circuit.

Systems of this type are known from the prior art. Examples are described in EP0493559, DE19502990, DE19505642

- 15 In EP0493559 a system is described wherein the sensor consists of a microphone which is connected in physical contact with the pipe. The microphone picks up any sound that is generated as a result of turbulence inside the pipe. This turbulence relates to the surface effect on water passing through the pipe as well as over obstructions such as limescale deposits. The microphone output signal controls through the feed back circuit the characteristics of the energy supplied to the field generating coil. The supplied energy
- 20 is related to the flow of water passing through the pipe and to the amount of limescale already build up within the system.

- 25 A sensor embodied as an electrode positioned in the wall of the tube and in contact with the fluid is described in DE19502990. The electrode and the thereto connected measuring circuit measures the water velocity. Dependent on the measured velocity the energy supplied to the field generating coil is varied. A disadvantage of this system relies in the fact that the electrode has to be installed inside the pipe, in other words, operations on the pipe have to be performed.

- 30 A Similar construction is described in DE19505642. The sensor comprises in this case an elastic electrode carrying a number of strain gauges. Dependent on the velocity of the fluid in the pipe the strain gauge signal varies and therewith the amount of power supplied to the field generating coil varies.

A general problem in all these prior art apparatuses is the calibration of the apparatus once it is installed. The influence of the field generated by the field generating



coil is dependent on the induction in the fluid. This induction is dependent on en large number of different factors such as:

- electrical properties of the fluid, e.g. the electrical conductivity, the higher the conductivity the lower the induction,
- 5 - the dimensions and the material of the pipe,
- the influence of external fields generated e.g. by nearby electrical apparatuses such as washing machines, dryers, ironing apparatuses, pumps, etc.

Most of these factors are not predictable, or at least not accurate enough.

10 The aim of the invention is now to provide an apparatus of the above-mentioned type which is embodied such that the influence of all these factors is taken into account.

In agreement with this object the invention now provides an apparatus as defined in the first paragraph of this specification, which is characterised in that

- the sensor comprises a field measuring coil mounted exteriorly of said pipe near the field generating coil,
- 15 - the feed back circuit comprises the electronics which together with said measuring coil acts as a field strength meter.

20 By measuring the real field developed under practical circumstances information is obtained on the basis of which the electronic circuit for energising the coil to develop an electromagnetic field in the fluid can be adjusted such that even under varying circumstances the proper field strength is generated

25 The field measuring coil can be positioned at various locations, such as around the field generating coil. This position however has the disadvantage that the configuration within the field generating coil is not identical toe the configuration within the field measuring coil. Therefor it is preferred that the measuring coil is positioned alongside the field generating coil with no or small intermediate distance.

It is preferred to use a feedback circuit in the same manner as in the above described prior art. In other words it is preferred that the electronic circuit for energising the coil comprises an amplifier and a signal generator, whereby the amplification value is adjusted dependent on the signal from the field strength meter.

30 The invention will be explained in more detail with reference to the attached drawings.

Figure 1 illustrates a general schematical layout of a system according to the invention.

Figure 2 illustrates another embodiment of the combined coils.

Figure 3 illustrates another shape of the field generating coil.

The system as illustrated in figure 1 comprises a field generating coil 10 mounted exteriorly of the pipe 12. The pipe 12 forms the flow path for a fluid which could be water, but also any other fluid, having the tendency to deposit limescale on the inner wall of the tube 12. The coil 10 is energised by an electronic circuit 14, such that a predetermined electromagnetic field is developed within the fluid inside the pipe 12. The effect thereof is that the depositing of limescale is prevented or even counteracted. Details of this whole process can be derived from the various prior art publications and other publications which are readily available to the expert in this field.

In agreement with the invention the system comprises furthermore a field measuring coil 16 which is preferably installed around the same pipe 12 alongside the field generating coil 10 at no or short distance from said coil 10. The measuring coil 16 is connected to field strength measuring electronics 18 such that in fact the coil 16 in combination with the electronics 18 forms a field strength meter. Such field strength meters are in general known for various purposes and therefore a detailed information thereof is considered superfluous.

To obtain a proper feedback circuit between the field strength meter electronics 18 and the field generating electronics 14 it is preferred that the electronic circuit 14 comprises a signal generator 20 and a variable amplifier 22. The signal generator 20 generates a signal of the required shape and frequency and the amplifier 22 takes care that the amplitude of this signal is at the correct value for energising the coil 10 in such a manner that a field of the required strength is developed inside the tube 12.

If there were no other fields or no other external influences the system comprising the coil 10 and the electronics 14 could be calibrated once and would then function properly. However, under practical circumstances one has to reckon with various different external influences. First of all the dimensions of the tube 12 are not always the same. The diameter of the tube may vary (in The Netherlands standard diameters of 9, 12, 15, 18, and 22 mm are used for domestic waterpipes) and furthermore the thickness of the wall of the tube is not always the same and may vary dependent on the quality and the maker of the tube 12. For industrial purposes pipe sizes will vary mainly from 22 mm to 1000 mm.

Further external influences are for instance the electromagnetical fields generated by domestic appliances, such as washing machines, driers, ironing irons, etc. Under

industrial circumstances one has to reckon with electromagnetical fields generated by pumps, electric motors, transformers, high voltage cables, etc.

To cope with these external influences the actual field generated at each moment is measured by the combination of coil 16 and field strength electronics 18. The electronics circuit 18 now delivers a signal to the amplifier 22 by means of which the amplification value of the amplifier 22 is adapted such that even in the presence of varying external fields always an electromagnetical field of the required properties is developed inside the tube 12.

It is preferred that the coil 16 is positioned alongside the generating coil 10. One could imagine a situation whereby the coil 16 is installed around the coil 10. In that case, however, the inner space within the coil 10 is filled by the tube 12 and the therethrough flowing fluid whereas the inner space within the coil 16 is filled with not only the tube 12 and the therethrough flowing fluid, but also with the windings of the coil 10. In other words, the measuring circumstances are not equal to the generating circumstances. Therefore, a position of the coil 16 alongside the coil 10 is preferred.

An alternative could be embodying the coil 10 with windings which have some intermediate distance whereby the windings of the coil 16 are positioned inside said intermediate gaps. In that case exactly the generated field is measured. The disadvantage, however, is the rather complicated coil construction. A practical example of this embodiment is illustrated in figure 2. The field generating coil is indicated by 10' and the measuring coil is indicated by 16'. The coils are positioned around a pipe 12'.

In the embodiments of figure 1 and figure 2 the field generating coil produces a field parallel to the direction of the fluid flow in the pipe. It is possible to embody the coils such that the direction of the field is perpendicular to the flow direction. Figure 3 illustrates an embodiment whereby the field generating coil is divided into two sections, one of which, section 26, is positioned on an arbitrary side of the pipe 30 and the other section, 26', which is not visible in the figure, is positioned on the opposite wall of the pipe 30. The coil 26 has the terminals 26a and 26b. Inside the coil section 26 the measuring coil 28 is positioned. The coil 28 has the terminals 28a and 28b. Also coil 28 could comprise two sections, a section on the visible surface of the pipe 30 and another section at the opposite, non-visible side of the pipe 30.

In general the field, generated by the field generating coil, is an alternating field with a frequency higher than 1 kHz and smaller than 100 kHz. To eliminate the influence

of any fields outside this range it is preferred that the electronics circuit 18 comprises a band pass filter 24 for filtering out too low and too high frequencies. The upper and lower limit of the band pass filter 24 eventually can be adjustable.

## Claims

1. System for treating fluids, especially water, in a pipe to resist scale deposits from building up in the pipe, comprising

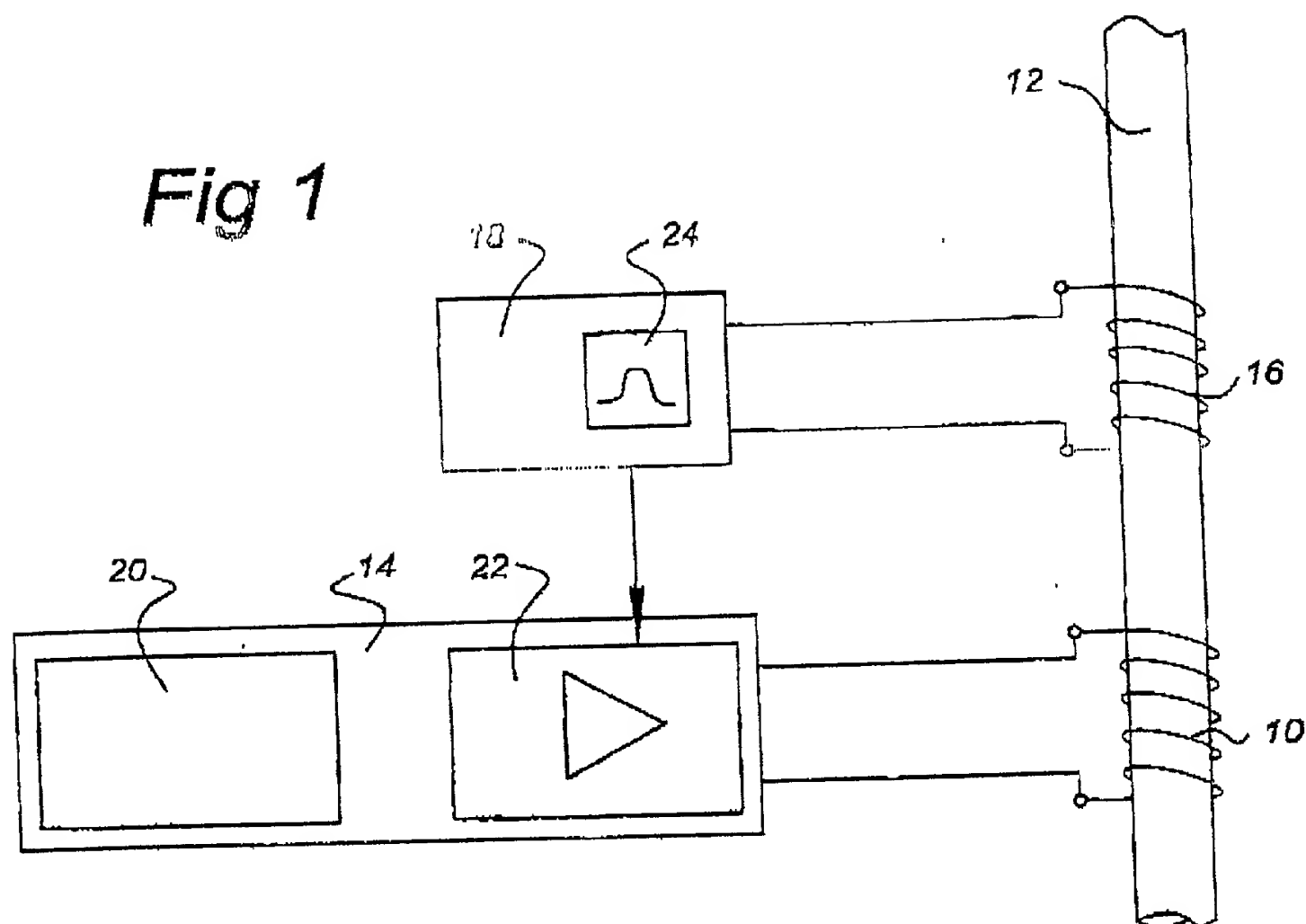
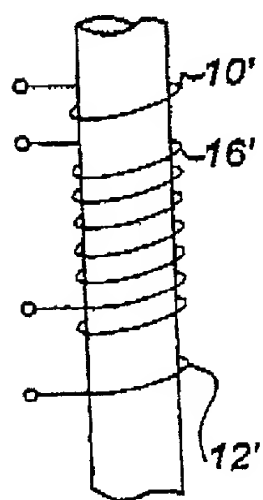
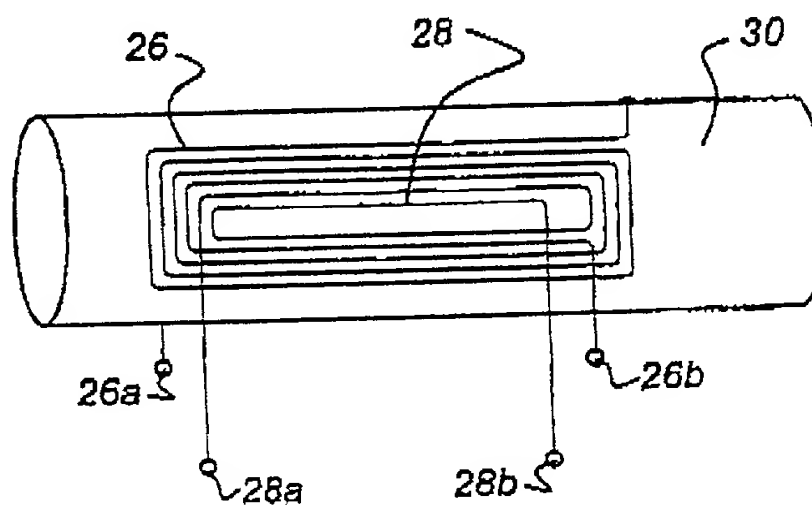
- 5 - a field generating coil mounted exteriorly of the pipe,
- an electronic circuit for energising the coil to develop an alternating electromagnetic field in the fluid,
- a sensor for sensing a parameter related to the functioning of the system and for generating a parameter dependent signal,
- 10 - a feed back circuit for feeding back said parameter dependent signal to said electronic circuit to control said circuit,
- characterised in that
- the sensor comprises a field measuring coil mounted exteriorly of said pipe near the field generating coil,
- 15 - the feed back circuit comprises the electronics which together with said measuring coil acts as a field strength meter.

2. System according to claim 1, characterised in that, the measuring coil is positioned alongside the field generating coil with no or small intermediate distance.

3. System according to claim 1 or 2, characterised in that the electronic circuit for energising the coil comprises an amplifier and a signal generator, whereby the amplification value is adjusted dependent on the signal from the field strength meter.

4. System according to one of the preceding claims, characterized in that the feedback circuit comprises a band pass filter.

1/1

**Fig 1****Fig 2****Fig 3**

# COMBINED DECLARATION AND POWER OF ATTORNEY

(ORIGINAL DESIGN, NATIONAL STAGE OF PCT OR CIP APPLICATION)

As a below named inventor, I hereby declare that

My residence, post office address and citizenship are as stated below next to my name, I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

## System for treating fluids in an electric field

the specification of which: (complete (a), (b) or (c) for type of application)

### REGULAR OR DESIGN APPLICATION

- a. ☐ is attached hereto.
- b. ☐ was filed on \_\_\_\_\_ as Application  
Serial No. \_\_\_\_\_ and was amended on \_\_\_\_\_  
(if applicable)

### PCT FILED APPLICATION ENTERING NATIONAL STAGE

- c. ☒ was described and claimed in International application No. PCT/NL00/00084  
filed on 11 February 2000  
and as amended on \_\_\_\_\_ (if any)

### ACKNOWLEDGEMENT OF REVIEW OF PAPERS AND DUTY OF CANDOR

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, paragraph 1.56(a).

In compliance with this duty there is attached an information  
disclosure statement 37 CFR 1.97

### PRIORITY CLAIM

I hereby claim foreign priority benefits under Title 35, United States Code paragraph 119 of any foreign application (s) for patent of inventor's certificate listed below and have also identified below any foreign application for patent of inventor's certificate having a filing date before that of the application on which priority is claimed.

(complete (d) or (e))

- d. ☐ no such applications have been filed  
e. ☒ such applications have been filed as follows

**EARLIEST FOREIGN APPLICATION(S), IF ANY FILED WITHIN 12 MONTHS  
(6 MONTHS FOR DESIGN) PRIOR TO SAID APPLICATION**

Country	Application Number	Date of filing (day, month, year)	Date of Issue (day, month, year)	Priority claimed
The Netherlands	1011304	15 February 1999		Yes

**ALL FOREIGN APPLICATION(S), IF ANY FILED MORE THAN 12 MONTHS  
(6 MONTHS FOR DESIGN) PRIOR TO SAID APPLICATION**

**CONTINUATION-IN-PART**

(Complete this part only if this is a continuation-in-part application)

I hereby declare claim the benefit under Title 35, United States code, paragraph 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claim of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, paragraph 112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, paragraph 1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.) (Filing date) (Status) (patented, pending, abandoned)

(Application Serial No.) (Filing date) (Status) (patented, pending, abandoned)

**POWER OF ATTORNEY**

As a named inventor, I hereby appoint the following attorney(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: Robert J. PATCH, Reg. No. 17,355, Andrew J. PATCH, Reg. No. 32,925, Robert F. HARGEST, Reg. No. 25,590, Benoît CASTEL, Reg. No. 35,041, Eric Jensen, Reg. No. 37,855, and Thomas W. PERKINS, Reg. No. 33,027 and Roland E. Long, Jr. Reg. No. 41,949 c/o YOUNG & THOMPSON, Second Floor, 745 South 23rd Street, Arlington, Virginia 22202.

Address all telephone calls to Young & Thompson at 703/521-2297.

Customer No. 000466



I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that wilful false statements and the like so made are punishable by fine or imprisonment, or both under Section 1001 of Title 18 of the United States Code and that such wilful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor: DE BAAT DOELMAN, Jan Pieter

Inventor's signature



Date 3 October 2001

Country of Citizenship: The Netherlands

Residence: AMSTERDAM, The Netherlands NLX

Post Office Address: Erasmusgracht 29/III, NL-1056 BC AMSTERDAM, The Netherlands

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09913407-14644